RETINA

Z2 and BLT Z3

User Manual

24-bit Graphics Boards
for the Amiga

software V2.3
Hardware Sec. XX 25051

English Manual, February 1995

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Chapter 1
Introduction

The Amiga's tremendous graphics capabilities are due in part to its custom chip set. However, because the chip set is so integrated with the operating system, upgrading the Amiga's video display is not a simple task. Compare this to the IBM PC compatible world, where the video display circuitry is generally on a removable card and accessed via custom driver software. This has allowed the PC platform to far surpass the native Amiga display modes in terms of number of colors and resolution.

The Retina graphics display card now brings the Amiga in line with the rest of the computer world by offering true 24-bit color (16.8 million colors) at high resolutions. Non-interlaced displays like 1280 x 768, 1280 x 1024, or even 2400 x 1200 are possible. Resolutions for interlaced displays can be even larger! Of course you'll need a monitor capable of handling the display requirements, but they are plentiful. (Note: A multiscan monitor will give you access to a wider array of displays.)

Due to its own internal 32-bit zero wait-state memory, the Retina is capable of smooth playback of 16 and 24-bit animations.

Retina comes complete with a variety of software including a full-featured 24-bit paint program and an image processing program. Other utilities include a display program, animation creator/player, and support utilities for some third-party applications.

There are two versions of the Retina. The Retina Z2 is a Zorro II card that works in all slotted-Amigas. The Retina BLT Z3 is a faster Zorro III version that takes advantage of the 32-bit bus in the Amiga 3000 and 4000 models.

Please examine any "readme" files on the installation disk for update information. The German readme files related to the German manual. Please disregard these files.

Also, please refer to the glossary for explanations of various terms used in this manual.

Conventions

Information that is to be entered into your computer will **appear in bold**. Special shortcut keystrokes will be listed like CTRL+M, which means hold the control key while pressing M. Information that will be displayed will use `this font`. Program and function syntax is listed like:

Program [switch1] [switch2 | switch3]

Switches may be required or optional, as noted. A vertical bar means the switches are mutually exclusive.

Chapter 2
Installation

This section covers hardware requirements, physically installing your Retina graphics card, monitor connections, software installation, and RAM information.

Hardware and Software Requirements

To use the Retina, you will need the following:

- An Amiga with a free Zorro II or Zorro III expansion slot
- A VGA or multiscan monitor with a high-density DB15 male connector
- A hard disk
- At least 1MB of chip RAM and 2MB of fast RAM
- AmigaDOS version 2.0 or greater

Installing Your Retina Graphics Card

Note: For a detailed explanation on removing the cover from your computer, please see the users guide that came with your particular Amiga model. You should also take anti-static precautions before opening your computer. (Various inexpensive commercial devices are available at most electronic and computer stores.)

1. Turn off your Amiga and all peripherals.
2. Remove the power cable from your Amiga.
3. Disconnect all cables from your computer.
4. Remove the cover mounting screws and set them aside.
5. Remove the cover. Be careful and make sure that no part of the cover accidentally snags on any internal cabling.
6. Select a free Amiga expansion slot.
7. Remove the single screw from the metal expansion slot cover, mounted at the rear of the case. Store the cover in a safe place. The screw will be used later.
8. Remove the Retina from its packaging and carefully insert it into the expansion slot. The bracket on the rear of the Retina should be oriented exactly like the metal expansion slot cover, which was just removed. Make sure the card is properly seated all the way down in the slot. Use light pressure and do not force the card in.
9. Secure the Retina card to the expansion slot with the screw from the removed metal expansion slot cover.
10. Replace the cover and all mounting screws.
11. Connect the high-density DB15 connector from your monitor to the Retina's video jack at the rear of your computer.
12. Reconnect the power cable and all other peripherals.

Note: The BLT Z3 has two additional jacks for Y/C and composite output; however, these require the optional video encoder module for operation. (see "V-Code Module" on page 95) These features are also available for the Z2 using the same module; however, the module must be used externally. (see "Automatic Video Switchbox" on page 95)

Installing the Retina Software

First make a copy of the software disks and use the copies for installation.

1. Insert the disk labeled "Retina".
2. Open the Install drawer and double-click the "Retina_Install_english" icon.
3. Follow the installation script instructions. The familiar AmigaDOS Installer program is used and all of the required software will be copied to your hard drive.

You will be prompted for permission to install optional files that support various third-party applications. In certain instances, it is important that these applications be previously installed with their appropriate logical assignments. (e.g., ADPro:) This allows the installer script to copy the files to the proper subdirectories.

The following is a list of various terms that may help you with the installation. There may be other terms that relate to your particular system, so please refer to your Amiga documentation as well.

- **ADPro** - This refers to Art Department Professional from Elastic Reality.
- **AnCoS** - This refers to the included non-linear editing system designed for the Retina, similar in function to ADPro's FRED utility.
- **Developer package** - This is technical information for Amiga software/hardware developers. Most users will not need to install this.
- **Imagemaster** - This is an image processing program from Black Belt.
- **R3D** - This refers to portions of the Retina software for Real 3D, a 3D modeling and rendering program.
- **RACE** - This is the included animation creation and playback system designed especially for the Retina.

Retina Directory Contents

The installation disk should set up a Retina directory that contains the following drawers:

- **AnCoS** - (see above)
- **R3D** - (see above)
- **RetinaDemos** - Contains various self-executing Retina demonstration programs.
- **RetinaTools** - Contains various utility programs, some accessible only through the CLI.
- **RACE** - (see above)

- **RetinaSystem** - Holds the main Retina programs.

Installing Other Bundled Software

Again, use copies of the program disks for installation. Simply double-click the appropriate install icon on the disk(s).

Retina Memory

The amount of RAM installed on your Retina will be automatically detected without the need to set any jumpers. You can use the RetinaAvail utility to verify the amount of RAM found. (see "RetinaAvail" on page 59)

The Retina Z2 and Retina BLT Z3 each come with four megabytes of RAM. This allows very higher resolutions and flicker-free double-buffered animation playback. The approximate amount of memory an image will use can be calculated using the following formula:

Width x Height x Bitplanes / 8 = bytes

So a 16-bit 800 x 600 image, for example, would need about a megabyte of memory (800 x 600 x 16 / 8). A 24-bit 1024 x 768 image, would need 2.4MB! (Of course, even if your Retina is equipped with enough memory, your monitor must still be able to handle the screen mode.)

The Retina BLT Z3 has a freely programmable clock chip. The first time the system is booted, the software automatically tests the maximum frequency of the installed RAM and saves this value as a preference setting. If your monitor shows screen "garbage" as the

board warms up, use the supplied Retina Memory Clock utility (see "RetinaMemClk" on page 61) to reduce the frequency slightly until the problem goes away. Remember to save the settings.

Chapter 3
How Retina Works With Your Amiga

Generally, an application will use the Retina in one the following ways:

- it's interface runs on an emulated Amiga screen
- it's interface runs on a true Retina screen
- non-interactive graphics display

Most applications, including the Workbench, will run on emulated Amiga screens. The applications will "think" they are running on standard Amiga screens; however, the display has been invisibly redirected to the Retina.

Before anything can happen, Retina needs to know two important things:

- The capabilities of your particular monitor.
- What Retina "screen mode" to use for each screen an application opens.

New screens are automatically assigned a user-definable default screen mode. Note: A single application can open more than one screen and each can have a different screen mode.

What is a Screen Mode?

A screen mode is generally defined by the number of bitplanes, plus the resolution (i.e., width and height), horizontal frequency, vertical frequency, and interlace

status. "16 bit 800 x 600 37500x59Hz i" is a screen mode. This particular screen is 16 bitplanes deep, 800 pixels wide, and 600 pixels high. It has a horizontal frequency of 37.5KHz and a vertical frequency of 59Hz. The lowercase letter i indicates the screen is interlaced. (Note: Depending on the program, bitplane information may or may not be listed.)

Deep Mode

The "deep" mode is a hybrid emulated Amiga screen that allows specially written programs to display 16 or 24-bit images in an Intuition window on what would normally be a standard Amiga screen. For example, Workbench emulation can use the deep mode. (see "How Deep is Your Love (For Colors)" on page 37)

True Retina Screens

Some programs open their interface directly on a "true" Retina screen without emulation. These programs will not run without a Retina (e.g., TVPaint) and have access to 8, 16, and 24-bit displays.

The Main Retina Programs

- **RetinaScreenMode** This is a preference setting program. Generally, once you have things set up properly, you won't need to run this program again. Use it to define the capabilities of your monitor (see "The RetinaScreenMode Program" on page 17).

  A second function of RetinaScreenMode is to define the default screen modes (8, 16, and 24-bit) for

programs that work directly with the Retina, but don't allow you to pick the screen mode they will use. The 16 and 24-bit settings will also be used by programs that run in deep mode, while the 8-bit (256 colors) setting will be used by programs that run on the Retina in AGA 256-color mode.

- **RetinaEmu** This is a program that runs constantly in the background. It intercepts screens that would normally open on the Amiga display and redirects them to the Retina card. Generally, parameters that affect emulated Amiga screens are defined using this program (see "The Retina Emulation Program" on page 21).

Overview

Once the hardware and software are installed, getting Retina to work with your system basically involves the following steps:

- Use RetinaScreenMode to define the capabilities of your monitor and select default screen mode groups for 8, 16, and 24-bit screens.
- Run the RetinaEmu background program and select a screen mode for the DEFAULT application screen and also select a screen mode for the Workbench.
- Use the AmigaDOS ScreenMode Preferences program to set the resolution and number of colors desired for Workbench.

These are the basic steps you need to take to get Retina going. With some applications, it will be a matter of

tweaking RetinaEmu parameters to coax them to work or optimize their performance.

What to Expect

The Retina is designed to be compatible with any Amiga application, except for ones that directly access the hardware instead of using the operating system. However, the reality is that these techniques are used in some popular programs to optimize performance, and any user is bound to own a few titles.

Also, some programs use overlapping screens to "build" an interface. Although these programs may run on the Retina, the need to swap between screens can be too burdensome in certain instances.

This means you'll probably need to either be able to switch your monitor between the Retina and normal Amiga output, or have two separate monitors. The optional automatic switchbox accessory (see "Automatic Video Switchbox" on page 95) is perfect for this; however, there are also third-party manual VGA switchboxes available, which work very nicely too.

Monitor Selection

If you want a one-monitor setup, for optimum performance a multiscan monitor is suggested that can scan down to the 15.75KHz Amiga video modes. These are harder to find, but are available. Note: You'll get the most out of your Retina using a two-monitor setup consisting of a standard Amiga monitor and a high-end SVGA monitor.

Chapter 4
"No Frills" First Time Setup

Because Retina is somewhat complex, the following step-by-step instructions will allow you to set up the Retina software for a basic working system.

The following procedure assumes the following:

- All of the software and hardware is installed.
- 1) A standard VGA (or better) monitor is connected to the Retina video output and a standard Amiga monitor is connected to the Amiga video output; or
  2) You have a single monitor and switchbox
- You know your monitor's horizontal and vertical scan rates.
- The RetinaEmu program is not already running. (If you selected the automatic startup option in the installation script and rebooted, it may be running.) If it is, press CTRL+F8 to bring up the interface and quit the program (RIGHTAMIGA+Q).
- This is a first-time setup. If it is not, you may not be able to follow all of the steps exactly. To start all over, you can rename (suggested) or delete the Retina directory in the ENVARC: directory, re-install the software, and reboot your system.

1. Double-click on the RetinaScreenMode icon located in the RetinaSystem drawer.

2. Try to locate your monitor in the Connected Monitor list (left window) of pre-defined monitors and click on it.

3. If yours is not there, use one whose specifications are similar to yours and type your monitor's specifications into the four string gadgets.

4. Set the Colors: gadget to `256`. Then in the Default Screen list (right window), click on a line that starts with `8 Bit Group 31k`. The end of the line should be either `60Hz` or a range that includes it (e.g., 50-70Hz).

   Click on the Test Image button and you should see a test pattern on your VGA monitor. Click the left mouse button to clear the test pattern.

5. Next, set the Colors: gadget to `65536`. Then in the Default Screen list, click on a line that starts with `16 Bit Group 31k`. The end should be either `60Hz` or a range that includes it.

   Click on the Test Image button and you should see a test pattern on your VGA monitor.

6. Next, set the Colors: gadget to `16.8 Mio`. Then in the Default Screen list, click on a line that starts with `24 Bit Group 31k`. The end should be either `60Hz` or a range that includes it.

   Click on the Test Image button and you should see a test pattern on your VGA monitor.

7. Click the Save button.

8. Now, double-click the RetinaEmu icon. This starts the Retina emulation background program and the

Workbench should come up on the Retina output (although it may look strange).

9. Select DEFAULT from the Application screen list (left window) by clicking on it.

10. Make sure the Output On: gadget is set to `Retina Standard` for this screen.

11. Pick a Screen Mode (right window) that starts with the word `Group` followed by `31k`.

12. Next, select `Workbench` from the Application screen list.

13. Make sure the Show All Screen Modes? option is active in the Global Settings menu.

14. Make sure the Output On: gadget is set to `Retina Standard` for this screen.

15. In the Screen Mode window, select `800x480 31500x60Hz` with the mouse. (Use something close if that mode doesn't appear, but remember the height and width.)

16. Click the Save button.

17. If you rebooted now, your Workbench would probably show up on this 800 x 480 Retina screen and only partially fill it. So to increase the size of the Workbench, click the ScreenMode icon located in your Workbench Prefs drawer. (This is a normal AmigaDOS system program.)

18. Click the Default checkmarks off and enter the width and height used in step 15. Do not worry about the Display mode setting.

19. Set the colors to 4.
20. Make sure the AutoScroll option is active.
21. Click the Save button.
22. If you have any windows open on your Workbench (excluding drawer windows), you will be asked to close them.
23. The Workbench display should reset and now fill the entire 800 x 480 screen! That's all there is to it.

Normal Amiga applications will now run on the Retina using the DEFAULT screen defined above.

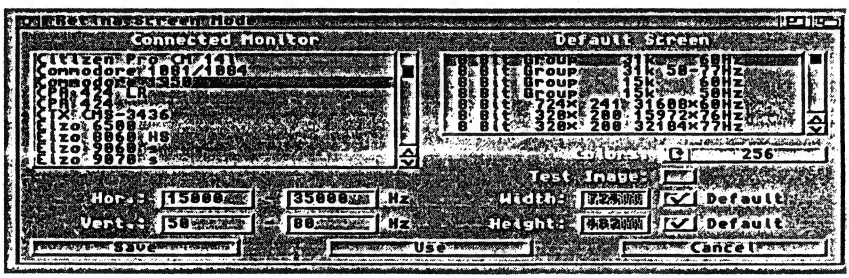
And Now for Something Completely Different

From this point on, you can modify the various Retina parameters for each Application screen that is set up. You may identify a particular screen mode that works best for most applications with your monitor. If so, change your default screen mode to it. You may also want to run the Workbench in deep mode and/or increase the resolution. There is much more to the Retina system and it is there for you to explore. It is all covered in great detail in the following chapters. Read on!

Chapter 5
Configuring Your Monitor

The first thing you need to do with the Retina software is configure it to properly work with your particular monitor. If at all possible you should have the technical specifications for your monitor handy.

The RetinaScreenMode Program



Double-click the RetinaScreenMode icon to run the program. If your monitor appears in the list of pre-defined monitors on the left side of the window, select it with your mouse. If your particular monitor does not appear in the list, go through the list and pick the monitor whose horizontal and vertical frequency capabilities match or come very close to your monitor's. You may also enter your monitor's specs right in the string gadgets. (If you want to, you can manually edit the monitor list with an ASCII text editor. The file can be found in ENVARC:RetinaMonitorList.)

If you are using a basic VGA monitor and don't have it's specs, find a monitor in the list whose horizontal

frequency is somewhere around 31500 - 31500Hz and a vertical frequency of 60 - 60Hz.

Warning: If the monitor definition is not properly set, your monitor can be physically damaged!

The right side of the window lists the default True Retina screen to be used for 8-bit (256 colors), 16-bit (65,536 colors), or 24-bit (16.8 million colors) screens. Cycle the Colors gadget to change the mode being displayed.

As mentioned before, these settings are used for applications use the Retina directly, but do not let you select a Retina screen mode. Most applications, however, that write directly to the Retina, will allow you to pick the screen mode they will use. The 16 and 24-bit settings will also be used by programs that run in deep mode, while the 8-bit (256 colors) setting will be used by programs that run on the Retina in AGA 256-color mode.

Note: You can optionally deactivate the default width and height options and enter your own resolution for each screen, but this is usually not necessary.

Screen Mode Groups

Groups contain a collection of individual screen modes. It is recommended you use groups, which allows the Retina software to pick the best screen mode on-the-fly. It assumes you want the maximum refresh rate possible with the specific monitor. (To view the individual screen modes within a group, use the RetinaMonitor utility. See "RetinaMonitor" on page 62)

An example group screen mode is `Group 31k 50-78Hz`. This is group of individual screen modes that have

a horizontal frequency of 31000Hz and vertical frequencies ranging from 50 to 78Hz.

Be sure to click the Save button to permanently save your settings. Clicking the Use button will retain your settings only until you reset your Amiga. Generally, once you've properly configured RetinaScreenMode you will rarely have to use it again, unless your system changes (e.g., adding new monitor).

RetinaScreenMode Menu Reference

Project Menu

Open (RIGHTAMIGA+O) Brings up a file requestor to allow you to load a RetinaScreenMode settings file.

Save As (RIGHTAMIGA+S) Brings up a file requestor to allow you to save a RetinaScreenMode settings file using a user-defined name.

About RetinaScreenMode Opens informational window.

Quit (RIGHTAMIGA+Q) Exits the RetinaScreenMode program.

Edit Menu

Reset to Defaults (RIGHTAMIGA+D) Adjusts all preference settings to their default values.

Last Saved (RIGHTAMIGA+L) Loads the last saved settings file from disk.

Restore (RIGHTAMIGA+R) Restores settings and application screen list to state that existed when the program was first started.

Settings

Show All Screen Modes? Show individual screen modes in right window in addition to Group modes.

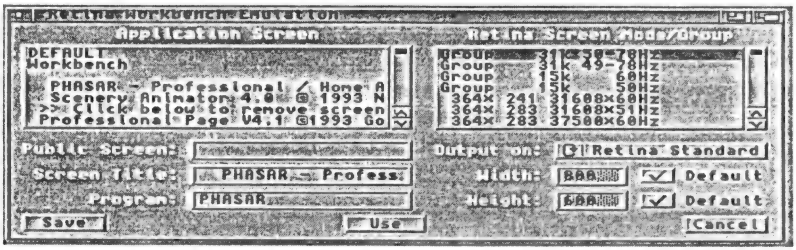
Auto Use? Automatically "uses" settings, but does not save them, when you close the window or quit the program. (These actions would normally cancel any changes made to the settings.) Settings will return to the last saved state when the system is rebooted.

Chapter 6
The Retina Emulation Program

RetinaEmu is an AmigaDOS commodity program and the heart of the Retina system. It takes care of redirecting the video output to the Retina and using the appropriate screen mode. In a sense, it is a video display traffic cop.

To accomplish this, anytime a program opens a new Amiga screen, Retina needs to know:

- if the screen should be displayed on the Retina or normal Amiga output; and
- if it is to be displayed on the Retina, what screen mode should be used.



Selecting the Video Output Method

By cycling the Output On button, you can indicate whether a program's output should be displayed on the Retina or through the normal Amiga video. Programs that rely heavily on directly manipulating the custom chip set--most notably games and some graphics programs--may require they be run on real Amiga screens.

Owners of the Retina BLT Z3 have a fast blitter Retina option, which should be used whenever possible. However, generally you'll only be able to make this determination through trial and error. This option is only for the best-behaved programs and cannot be used in conjunction with any refresh options. Additionally, some Amigas may experience problems using it with a 16/24-bit Deep mode Workbench.

Selecting the Retina Screen Mode

The first time a program is run, RetinaEmu adds an entry to it's list of screens (left window) using the settings for the DEFAULT screen. You can subsequently go back and edit the settings assigned to a screen, if you want something other than the default values. The Default values themselves can also be modified. Just select DEFAULT from the screen list (it should be the first entry) and change the selected screen definition. (Note: Changing the default screen mode will not change any application screen previously set up.)

RetinaEmu keeps track of every screen it opens. To keep each screen definition unique, it uses the calling program's name, the text in the screen's titlebar, and the public screen name (if any). This list is automatically saved.

Is Interlace Really So Bad?

Interlaced screen modes (designated with a lowercase letter i) will not flicker harshly if their vertical refresh rate is above 70Hz. So don't shy away from a screen mode simply because it is interlaced.

Screen List Pattern Matching

You can manually edit or set up a screen list entry. Sometimes applications use a data filename as part of a screen name (e.g., "CoolEdit v1.1 file:s:StartupSequence") or increment public screen names (e.g., "CoolEdit.1", "CoolEdit.2", etc.). Normally, this would cause many screen list entries to be created. The solution is to use standard Amiga "wildcards" to create a single screen list entry that covers multiple screen names.

EXAMPLE **CoolEdit v1.1 file:s:StartupSequence**

could be changed to

CoolEdit v1.1 file:#?

CoolEdit.1, **CoolEdit.2**, etc.

could be covered by a single entry of

CoolEdit.#?

Screen Mode Groups

(See also "Screen Mode Groups" on page 18.)

When a group is used, the Retina software will pick the screen mode contained in that group with the highest vertical frequency possible that fits the specifications of the screen an application is trying to open. A group called "Group 31k 50-78Hz" would include multiple resolutions with a horizontal frequency of 31kHz. The vertical frequencies would range between 50 and 78Hz.

(Note: Higher resolutions will be interlaced.) For the best possible display try using a group with the highest horizontal frequency and widest vertical frequency range.

If you have Show All Settings active in the Global Settings menu, all of the individual screen definitions will appear with the groups.

Generally, selecting a group is best; however, sometimes you may not like the Retina software's selection. In such cases, you may want to pick a specific screen mode. If you find an individual screen mode that works best with most of your applications, by all means change the default screen mode to this. You can always change the exceptions afterwards.

Using a High Resolution Screen

Many newer Amiga applications (but not all) give you nearly unlimited control over the size of the screen they run on. Of course, normally you'd end up with a "virtual" screen that you'd have to scroll around. Using the Retina, you can have a high resolution screen displayed in its entirety (scrolling is also supported, however). Note: Specifying a screen with a resolution greater than the program requires will work fine, but its interface will not fill the screen.

If a group screen mode is being used, you may be able to just tell the application to use a higher resolution. However, if you don't like the resolution chosen, here is an example of how to run an application using a specific high resolution screen:

Example

1. If there is not already an Application Screen entry in RetinaEmu, run the application and then exit. (RetinaEmu should be running the background already.)
2. Open the RetinaEmu window (CTRL-F8).
3. Find the Application Screen entry and select a screen mode with a resolution of, say, 768 x 482.
4. Click off the default width and height checkmarks, but leave the settings at 768 and 482.

   Note: Turning off the default checkmarks allow certain applications to automatically detect the resolution of a screen and adjust to it.
5. Click the Save button.
6. Run the application again.
7. Some newer programs will automatically change to the new screen size. If yours does not, follow your application's documentation and change the screen resolution to 768 x 482. If there is an AutoScroll option, select it. Note: Not all applications let you change the screen resolution.
8. The application should now run on a nice 768 x 482 screen.

Virtual Retina Screens

If the output is set to Retina, you can click off the default width and height checkmarks and enter different values. This will allow you to set up a screen that is larger (or

smaller) than the displayable area. (This is very similar to how the AmigaDOS ScreenMode Preferences program operates.)

Let's say you wanted to use an application on a 1024 x 768 screen; however, that resolution on your 14-inch monitor was too hard on your eyes. A virtual Retina screen may be the answer and here's a modification of the preceding example on how to do it:

Example Use the same procedures as above, but change the RetinaEmu width and height values to 1024 and 768, respectively (use the same screen mode). Also set Auto Scroll Area to Maximum in the Screen Settings menu.

The program should now run on a 1024 x 768 screen where only 768 x 482 is visible. The display should scroll as your mouse pointer hits the edge of the display, giving you access to the full 1024 x 768 screen.

Selecting Too Small of a Screen

Unless you use the virtual screen method described above, setting an individual screen mode with a resolution that is smaller than what the program needs may crash the program. (It may also suddenly appear on the Workbench, if it has that ability.)

Workbench Exception

Note that the Workbench Application Screen entry is the single exception where you cannot click off the default width/height checkmarks. You must set the Workbench resolution using the Workbench ScreenMode Prefs program. For more on this, see Chapter 7, "Supercharging the Amiga Workbench."

Setting the Refresh Mode

Some programs use "illegal" routines to update graphics. In such cases, the Retina screen will not be properly updated. If you feel this may be happening, press the manual refresh hotkey, CTRL-F7.

If the application you are using requires manual refresh, you can have Retina do it for you at various intervals. Settings range from once, several times, to continuous. Note that this may slow down the performance of the Retina considerably. However, the alternative is that the programs could not be run at all on the Retina.

These settings are accessible using Refresh Mode from the Screen Settings menu. Each individual screen can have a different refresh setting.

Screen List Housekeeping

After a while you may find the screen list may be getting quite large. To keep RetinaEmu running at top efficiency, you may want to eliminate screen list entries for obsolete or rarely used programs by selecting the screen and clicking the Delete button. Also check for wildcard opportunities. (see "Screen List Pattern Matching" on page 23)

Remember each screen entry is totally unique. Often when an application is upgraded, the programmers change the actual program name or screen names. In such cases, RetinaEmu will create new screen list entries. Obviously, the old ones can be deleted.

AGA Emulation

The Retina can emulate AGA-only modes like 256-color screens. (HAM8 cannot be emulated; however, HAM8 images can be displayed on a 24-bit screen.) With properly written applications, you should be able to select 256 colors in the program's screen mode set up window. Note: Some programs may require the Workbench be in 256-color mode first.

Unfortunately, many AGA programs are games or graphics programs that write to the Amiga custom chip set directly. As such, their compatibility with the Retina will vary.

Opening the RetinaEmu Window

There are several ways to make the RetinaEmu window appear, once it is already running in the background.

- Use the hotkey CTRL+F8
- Double-click the RetinaEmu icon
- Run the RetinaEmu program from the CLI
- Run the AmigaDOS CommodityExchange program

Changing the Hotkeys

RetinaEmu has four hotkey settings:

- Manual Refresh. Default: CTRL+F7
- Open RetinaEmu window. Default: CTRL+F8

- Bring the currently active emulated-Workbench screen to the front. Default: CTRL+F9
- Toggle between non-emulated Retina displays. Default: CTRL+F10

If you find that these setting conflict with another program, you can change them at any time. Special keystroke combinations can be defined using the following keywords: shift, lshift, rshift, alt, lalt, ralt, lcommand and rcommand (the Amiga keys), control, capslock, numericpad, up, down, left, right (cursor keys), f1 through f10 (function keys), esc, tab, space, backspace, help, return, and enter.

EXAMPLE **lshift ralt F7** defines pressing the left Shift key, the right Alt key, and F7 simultaneously.

RetinaEmu ToolTypes

The following are the recognized RetinaEmu ToolTypes:

CX_POPUP To suppress the display of the window when the program is first run, add "CX_POPUP=NO" to the icon ToolTypes. No option or "CX_POPUP=YES" will let the window pop up.

CX_PRIORITY This sets the priority of the hotkeys compared to other active commodity programs. Acceptable values are -128 to 127.

ALL Use this option after your Amiga is booted and running. This will cause all active screens to be initially displayed on the Retina. Note that the original screen resolutions will be used. Any related screen list entries tracked by RetinaEmu will be ignored.

NOWB This is generally a test or debug option only. It prohibits the Workbench from being displayed on the Retina. This is needed in situations where Workbench is not being displayed properly on the Retina and it is impossible to reset the RetinaEmu settings otherwise.

RetinaEmu Shell Parameters

The Shell Parameters for RetinaEmu are identical to the ToolTypes.

Starting RetinaEmu Automatically

From the Workbench

To have the Retina software start automatically every time you boot your computer, simply drag the RetinaEmu icon to your WBStartUp drawer. (Note: The installation script will have done this for you, if you chose that option.) Make sure the icon ToolTypes include the lines:

DONOTWAIT
CX_POPUP=NO

From User-Startup

If you would rather not use the WBStartUp drawer, you can alternatively add the following line to your User-Startup file:

RUN >NIL: [Path:]RetinaEmu CX_POPUP=NO

where [Path:] is the directory where the RetinaEmu program resides. (Note: We do not advise you to directly alter your Startup-Sequence file.)

Temporarily Disabling RetinaEmu

Some programs, especially games, take over the system completely. These may not work if RetinaEmu is running, even if you direct them to the normal Amiga output.

The reason is that Retina starts an interrupt used by the system as an interrupt-server. If a program now locks the system, this interrupt cannot be used anymore and the Amiga freezes.

To solve the problem, run **RetinaIrq OFF** at a CLI prompt. (see "RetinaIrq" on page 61) Now start the offending program. Note that afterwards, double-buffering will no longer work and switching between screens will lead to harsh flickering. Activate the interrupt with **RetinaIrq ON** after you exit the program.

RetinaEmu Menu Reference

Project Menu

Save (RIGHTAMIGA+S) Saves current settings and closes window.

Use (RIGHTAMIGA+U) Closes window without saving settings.

Cancel (RIGHTAMIGA+C) Cancels any changes made since opening window.

About RetinaEmu Opens informational window.

Quit (RIGHTAMIGA+Q) Shuts down RetinaEmu and returns video to the normal Amiga display mode.

Edit Menu

Reset to Defaults (RIGHTAMIGA+D) Adjusts all preference settings to their default values. Does not affect application screen list.

Last Saved (RIGHTAMIGA+L) Loads the last saved settings file from disk.

Restore (RIGHTAMIGA+R) Restores settings and application screen list to state that existed when RetinaEmu window was opened.

Screen Settings Menu

Auto Scroll Area This determines how much of the screen is visible (not the screen size). If the screen is larger than this area (a virtual screen), it will automatically scroll as the mouse pointer hits the edge of the auto scroll area. If used, generally Maximum is the optimum setting.

Refresh Mode Set how long the screen should be refreshed by the software. This is for ill-behaved software that would otherwise require manually refreshing the screen.

Refresh Interval If the Refresh Mode is set to continuous, set how often the refresh should take place here.

Delete Screen Entry (RIGHTAMIGA+D) Selecting this will delete the application screen entry currently defined by the three string gadgets.

Global Settings Menu

Panel Screens? Select this if you wish the Retina to attempt to emulate panel screens (i.e., overlapping screens). Generally, this is possible only when the two screens use the same screen mode. This can also cause mouse pointer location problems. Generally, this option should be off.

HiRes Pointer? Select this to turn the mouse pointer into a high resolution mouse pointer. Note: The mouse pointer may not operate properly with all programs.

Use Monitor Switch Box? Select this to utilize the optional switchbox. This allows automatic switching between the Retina video output and the normal Amiga output. (See "Automatic Video Switchbox" on page 95)

Show All Screen Modes? Show individual screen modes in right window in addition to Group modes.

Use Path? This includes the path for the calling program when a screen list entry is defined. This means that if the same exact program is run from two different directories, for example, two separate screen list entries will be created. With this option off, the same screen list entry could be used by the same program no matter how many different places it was stored. Generally, this option should be off.

Scrolling Set the speed of *text* scrolling. This affects the amount of CPU resources available for other tasks.

Workbench Color Depth Set if you want the Workbench to use the normal number of colors or be 16-bit or 24-bit deep mode. The later two modes will allow full-color

images and animations to be shown on the Workbench in an Intuition window. (For more information see Chapter 7, "Supercharging the Amiga Workbench".) Note: You cannot use a 16/24-bit Workbench in conjunction with the Retina Blitter output option (Z3 only).

Hotkey Descriptions Change the definitions for the hotkeys. Uses the standard Amiga key-naming conventions. See "Changing the Hotkeys" on page 28 for more information.

Chapter 7
Supercharging the Amiga Workbench

Now, using the Retina, you can go beyond AGA capabilities and performance. The resolution of your Workbench can be nearly as large as your monitor will allow. As far as colors go, while an AGA Workbench is limited to 256 colors, a Retina Workbench can display images and animations using up to 16.8 million colors in standard Intuition windows!

Better yet, because the Retina is not affected by the "bottleneck" inherent in the Amiga chip set, your Retina Workbench will actually run faster. A 256-color Workbench on the Retina BLT Z3 is actually as fast as a four color standard Workbench!

If you've gotten through the previous chapter, you should already have Workbench running on the Retina. This chapter will help you set up a high resolution Workbench, plus get you up to speed on all the other benefits of the Retina Workbench.

Defining the Retina Workbench Screen

1. Open the RetinaEmu window (assuming it is already running) and select Workbench from the application screen list. (It should be the second one in the list, after DEFAULT)

2. Now choose a high resolution screen mode, like 800 x 600.

3. Make sure the output gadget is set to `Retina` and not `Amiga`.
4. Choose a Workbench Color Depth from the Global Settings menu, if you want to display 16 or 24-bit images or animations on your Workbench (Deep Mode). (16-bit uses less overhead and looks nearly as good as 24-bit.)
5. Save the settings.
6. Now run the standard AmigaDOS ScreenMode program located in the Workbench Prefs drawer.
7. Click off the "Default" check boxes and enter 800 for the width and 600 for the height. Note: The display mode (i.e., Hi-res, Lo-res, etc.) doesn't matter, only the resolution values.
8. Activate the AutoScroll gadget
9. Select the number of colors to use on your Workbench to 4.
10. After you get the Workbench emulation working, you can increase this all the way up to 256, if you like. However, see the caveat below, under "How Deep is Your Love (For Colors")

    Note: This setting is totally independent of the Workbench Color Depth setting in RetinaEmu.

11. Save the settings
12. Note: If you have any windows--other than drawers--open on the Workbench, you will be asked to close them before the new mode will engage.

Higher resolutions demand a larger monitor. 800 x 600 is about maximum with any readability on a 14-inch monitor. Adjusting your system font Preferences to use larger fonts may help legibility.

How Deep is Your Love (For Colors)

As previously mentioned, the number-of-colors setting in the AmigaDOS ScreenMode program is independent of the Workbench Color Depth setting in the Global menu of RetinaEmu. Essentially, the Preferences ScreenMode program determines the number of colors AmigaDOS thinks the Workbench is using. The RetinaEmu Workbench Color Depth determines the color potential for specially-written programs that can use the deep mode, like RetinaDisplay and PlayRACE. These programs can display 16 or 24-bit images right on the Workbench in a standard Intuition window.

To verify the deep mode is working, run RetinaDisplay and select Show Picture In Window from its Settings menu. A window should appear on the Workbench.

Caveat: Generally, the number-of-colors setting in the AmigaDOS ScreenMode program should not exceed four, if you want to use a 16/24-bit deep Retina Workbench.

Do I really need a 256-color Workbench?

Since you will be able to show 24-bit (or 16-bit) images and animations on the Workbench with the Retina, there are few reasons to waste your system resources on a 256-color Workbench. In fact, there is even less reason since, a Workbench color depth of greater than four may preclude using a 16/24-bit Workbench. Unless there is some application that can benefit from a 256-color

Workbench (i.e., it will not open on an emulated 8-bit Amiga screen by itself), it is best to stick with a four-color Workbench.

Solving Problems with Workbench Emulation

In the process of setting up your Workbench screen to run the Retina, you may encounter times where you don't get a stable picture or even any picture at all. Generally this is due to improper RetinaEmu settings for the Workbench or incompatible resolution settings in the AmigaDOS ScreenMode program.

In such cases it may be impossible to utilize the mouse. However, you can use the following keystrokes to disable the RetinaEmu program, allowing you to regain control.

Disabling RetinaEmu Using the Keyboard

1. Press CTRL+F8
2. Press RIGHTAMIGA+Q
3. The Workbench will be displayed on the Amiga output again.
4. Check Settings in RetinaScreenMode, Workbench settings in RetinaEmu, and AmigaDOS ScreenMode settings. You may have to use the NOWB tooltype if the culprit is in the RetinaEmu settings. (see "NOWB" on page 30)

Chapter 8
RetinaDisplay

RetinaDisplay can be used to view images and simple animations (using a sequence of images) on your Retina in any color mode from 256-color to 24-bit.

Running RetinaDisplay from the Workbench opens a small window. The window has a "drop-in field" where you can drag and drop image icons with your mouse to view the images. (Just drag the image's icon holding the left mouse over the drop-in field and release.) Alternatively, you can access a file requestor from the menu.

If you iconify RetinaDisplay, an AppIcon will appear on the Workbench on which you can also drag and drop image icons.

If you are running a deep Workbench and have selected Show Picture In the Window? from the Settings menu, the window that appears on the Workbench doubles as a drop-in field.

RetinaDisplay Menu Reference

Project Menu

Open (RIGHTAMIGA+O) Opens a file requestor to load an image.

Iconify Iconifies the program, leaving an AppIcon on the Workbench.

Info (RIGHTAMIGA+I) Displays some information about the image last loaded.

About RetinaDisplay Opens informational window.

Quit (RIGHTAMIGA+Q) Exits the program.

Settings Menu

RMB Closes Screen? If active, the right mouse button will close the screen displaying the image.

Lock Screen Mode? This locks the screen modes used by RetinaDisplay to the ones currently set in the RetinaScreenMode program. Subsequent changes to RetinaScreenMode will have no effect on RetinaDisplay.

Center Picture? If the picture is being shown in a Workbench window, this feature will center an image that is larger than the window. Otherwise, the image will begin in the top-left corner.

Virtual Screens? If an image is being displayed whose resolution is greater than the size of the screen mode, you can use the arrow keys to scroll around the entire picture, when this option is activated. Otherwise the image will be cropped.

Show Picture In Window? If you are running a deep Workbench, this option opens the Intuition image window.

Closing the Image Display Screen

Press the ESC key to close the display screen and quit the program. If the RMB Closes Screen? option is active

in the Settings menu, the right mouse button will close the display screen, but not the Workbench interface window.

If for some reason you can't quit, try to use CTRL+F9, CTRL+F10, or LEFTAMIGA+M to get back to the Workbench. RetinaDisplay can then be closed normally.

Using RetinaDisplay from the CLI

The syntax for RetinaDisplay is:

RetinaDisplay [image1, image2, ...] [PAUSE n] [TICKS n] [LOOP n] [B] [R] [NOWINDOW] [WINDOWOUTPUT] [SCREENOUTPUT] [KEEPSCREEN] [FULLWIDTH] [USE16] [FPS n] [BBG] [BOARD n]

If you do not specify an image file, a file requestor will appear to allow you to select one or more files.

B Use this for a looped sequence of images. The first run will be normal speed while reading from the hard drive, then the pictures will be kept in a RAM buffer for much faster display.

BBG This forces color 0 (8-bit images only) to black.

BOARD n The value n can be 0 to 3, representing the four possible Retina cards. This might be used for a multiple-monitor demonstration.

FPS n This sets the maximum frames per second when showing a sequence of images.

FULLWIDTH To speed up playback, RetinaDisplay automatically reduces the width of an image to be divisible by 16. This option disables this feature.

KEEPSCREEN Keeps image in Retina memory, even if RetinaDisplay is closed. Use **RetinaAvail Flush** (See RetinaAvail on page 59) to clear this out.

LOOP n is the number of times the list of images should be displayed.

NOWINDOW This suppresses the interface window that usually appears on the Workbench.

Additionally, RetinaDisplay will quit as soon as the image is displayed. To keep the image in memory, use the Keepscreen option.

PAUSE n is the number of seconds to pause between images.

R This is used in conjunction with the B option. A sequence of images will play forward and then reverse. (i.e., Ping pong)

SCREENOUTPUT Forces output to a separate screen.

TICKS n is the number of 1/50 of a second to pause between images.

USE16 This forces the output to a 16-bit screen.

WINDOWOUTPUT Forces output to a Workbench window, if Workbench is being run in deep mode (i.e., 16 or 24-bit).

EXAMPLE **RetinaDisplay Pic1 Pic2 Pic3 PAUSE 3 LOOP 5 B**

This will display the three images one after the other, five times with a three second break (plus loading time) between images. After the first pass, the images will be played directly from a RAM buffer.

Specifying a Range of Image File Names

For numerically sequenced file names, you can use the UPTO parameter.

EXAMPLE **RetinaDisplay Pic.001 UPTO Pic.050**

This would display the image files Pic.001, Pic.002, ...to Pic.050.

Automatic Double-Buffering

If you display more than one image and have enough Retina memory, RetinaDisplay will automatically use double buffering for smoother animations.

Using a Script File

You can also define a script file as a parameter. This is an ordinary ASCII file containing commands to control RetinaDisplay.

The following commands are available for a script file. (Most are the same as their CLI counterparts, described above, with exceptions as noted):

BLACKBACKGROUND Same as the BBG option, above.

BUFFERFORWARD and **BUFFERREVERSE** If the Usebuffer option is used with the Display command,

these options will display the buffer in forward or reverse order, respectively.

BUFFERNUMBER n Displays the Nth image in the buffer.

DISPLAY <filename> [UPTO <filename>] [USEBUFFER] This defines which image files should be displayed. The Usebuffer option reads the images into a RAM buffer. You must use either BufferForward or BufferReverse to utilize the buffer in looped play. You can have more than one Display line in a single script.

The Display command is implied, so you can just start with the filename. However, this assumes that the image filename does not conflict with a command word.

FRAMESPERSECOND n Same as the FPS option, above.

LAB label Provides a script line location reference for the Skip command. Label can be any user-defined string.

LOOP Continuously loops the playback. Note that you cannot set the number of times to loop.

SKIP label BACK Instructs the script to continuing executing from the defined label.

USE24 This forces the output to a 24-bit screen.

PAUSE, TICKS, and USE16 can also be used.

To comment out a line, begin the line with a semi-colon (;). Also, remember to end the last line with a carriage return.

EXAMPLE **RetinaDisplay Script MyPics**

Where "MyPics" is an ASCII file that looks like:

```
Display Work:Pic.001 Upto Work:Pic.005 Usebuffer
Display Work:pics/Monique.iff Usebuffer
Lab Comehere
Bufferforward
Bufferreverse
Skip Comehere Back
```

Aborting A Script

Animations or the performance of a script can be terminated by pressing CTRL+C after an image is loaded or press the ESC key.

Using RetinaDisplay With Directory Opus

RetinaDisplay can be added as a button on the Directory Opus (DOpus) interface. You can also make it so that when an image file is double-clicked, it is displayed with RetinaDisplay.

To configure DOpus to automatically display an IFF ILBM picture using RetinaDisplay, do the following:

1. Select Configure from the Project menu.
2. Click the Filetypes button.
3. Make sure the ILBM filetype is not already defined. If it is, click the Delete button and select the ILBM action line.
4. Click the New button.
5. Click on the `Picture, IFF ILBM` line.
6. In the Events window, click on the Double-click action.

7. Enter **Display a picture on Retina** in the Event Description field.
8. Cycle the Command Type gadget until it says AmigaDOS.
9. Click the New Entry button and enter **RetinaDisplay {F} ScreenOutput** in the entry field. (Note: You may have to add the path, if DOpus can't find the RetinaDisplay program.)
10. Click the Okay button.
11. Select Save from the Configure menu.
12. Click the following two Okay buttons.

Now when you double-click on any IFF ILBM picture file, it will be displayed with RetinaDisplay. Press ESC to quit. You can define the same action for JPEG and other recognized and supported image filetypes.

To add a RetinaDisplay button:

1. Select Configure from the Project menu.
2. Click the Buttons button.
3. Select a free (open) button.
4. Enter **Retina** in the Name field.
5. Choose some cool button colors, if you like.
6. Cycle the Command Type gadget until it says AmigaDOS.
7. Click the New Entry button and enter **RetinaDisplay {F} ScreenOutput** in the entry field. (Note: You

may have to add the path, if DOpus can't find the RetinaDisplay)

8. Click the Okay button.
9. Select Save from the Configure menu.
10. Click the following two Okay buttons.

Chapter 9
DefineMonitor

Although Retina offers hundreds of different resolutions, it is still not enough, since each monitor may react in a different way to the same screen mode. Often, the width, height, or position of an image will not be correct. Monitors without digital memory often need manual adjustment any time a different screen mode is used.

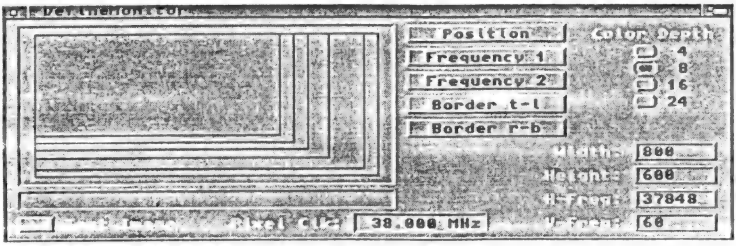
DefineMonitor is a tool that has been designed to help resolve this problem, as well as to create customized screen modes using any resolution, frequency, sync, and position.

Note: Use DefineMonitor with caution. You can cause physical harm to your monitor if you use screen modes outside the capabilities of your monitor.

Some of terminology used in DefineMonitor is both complex and technical. Try following the tutorial to observe the "meat" of the program. You can create a screen mode using a handful of the options. Don't worry if you don't use or understand them all!

It may be helpful to simultaneously use two monitors, one connected to the Amiga video output and the other to the Retina. This will allow you to see screen messages as you fine tune a screen mode.

The DefineMonitor Interface



Color Depth Sets the color depth for the screen mode being defined to 4 (16 colors, RetinaEmu use only), 8 (256 colors), 16 (65,536 colors), or 24 (16.8 million colors)

Width Sets the width in pixels of the screen mode being defined.

Height Sets the height in pixels of the screen mode being defined.

H-Freq Sets the horizontal frequency for the screen mode being defined. This will be automatically adjusted as the width and height values are changed.

V-Freq Sets the vertical frequency for the screen mode being defined.

Pixel Clk This is an information only display of the screen mode's pixel clock. (see also "RetinaMemClk" on page 61) This can range from 7MHz to 110 (90 for Z2), depending on your monitor and Retina board version.

Test Image Click this to view a test pattern based on the current settings. Certain editing functions are also accomplished on the test screen. Click the right mouse button or press the ESC to clear the image. (Note: The

left mouse button will also work, if the mouse pointer is outside the DefineMonitor interface window.)

The large rectangle outline represents the screen specified by the width and height settings. The Unit # can be 0 to 3 representing the four possible Retina boards. Other information mirroring the various settings are also displayed.

If the display seems extremely distorted, close the image quickly. You may be displaying a screen outside your monitor's capabilities, which could damage your monitor.

The following options set the edit mode that is active when the test image is displayed:

Position Click this button followed by the Test Image button. You can then use the arrow keys to center the test pattern.

Frequency 1 Click this button followed by the Test Image button. You can use the arrow keys to adjust the SyncEnd, BlankEnd, and Total parameters. These adjustments will change the horizontal and vertical frequency settings.

Frequency 2 Click this button followed by the Test Image button. You can use the arrow keys to adjust the BlankEnd and Total parameters. These adjustments will change the horizontal and vertical frequency settings.

Border t-l and **Border r-b** Click either button followed by the Test Image button. You can use the arrow keys to adjust the top and left or right and bottom borders.

Generally, the object of this exercise is to fit the colored rectangle into the white outlined rectangle.

Rectangle Window In addition to the Frequency 1 and 2 parameters, you can also select various display signals manually by clicking on the Rectangle Window and then using the Test Image. You can select more than one by holding down the shift key while you click. The "information bar" beneath the window will indicate which signals have been selected. Here are the meanings of the signal abbreviations and what the arrow keys do:

- **DE** (Display End) Adjust the screen size.
- **BS** (Blank Start) Modify the right and bottom border.
- **BE** (Blank End) Modify the top and left border.
- **SS** (Sync Start) Modify the sync start (position) setting.
- **SE** (Sync End) Modify the sync end (position) setting.
- **TT** (Total) Modify the end-of-line setting.

Sudden Flashes

If your screen flashes, that is a warning that the settings are outside the capabilities of your monitor, based on the DefineScreenMode settings.

You should also get a message in the Message window. It may be best to click this little window closed after getting and noting an error message. Otherwise, it may be difficult to tell if you get another one.

Using Custom Screen Modes

To make your custom screen modes available to Retina, you must run RetinaMonitor as follows:

RetinaMonitor append <path:filename >

Where path:filename is the screen mode file you created with DefineMonitor. You can place this line in your User-Startup file to have the modes always available.

Only four-bit definitions will be available to RetinaEmu. Also, make sure this command is executed before the RetinaEmu program. (see also "RetinaMonitor" on page 62) The easiest way to ensure this is to include the RetinaMonitor line in your User-Startup file and run RetinaEmu from the WBStartup drawer.

Example

Here is a simple example which will show you how to create a standard Hi-res (640 x 400) screen mode usable by RetinaEmu. This can be quite useful, since Retina does not have a pre-defined one. **(Note: To complete this example, you need a Amiga-compatible multiscan monitor like the 1950 or 1960.)**

1. Set Color Depth to 4.
2. Input **640** into the Width field and press ENTER.
3. Input **400** into the Height field and press ENTER.
4. The H-Freq should change to some number automatically. Press ENTER by itself to accept this setting.
5. Input **60** into the V-Freq field and press ENTER.

6. If the screen flashes at this point, the screen mode being defined may be outside your monitor's capabilities. **Do not complete the rest of this example.**
7. Click the Position button. The information bar should say `SS SE  Position`.
8. Click the Test Image button.
9. Use the left and right arrow keys to center the image.
10. Press ESC or click the right mouse button.
11. Click the Border t-l button. The information bar should say `BE  Border t-l`.
12. Click the Test Image button.
13. Use the left and right arrow keys to align the left side of the colored background with the left side of the outlined box. You may be allowed only one keypress.
14. Press ESC or click the right mouse button.
15. If you pressed the arrow keys one too many times, the Messages window may have opened with some error note. Just ignore this for now.
16. Click the Border r-b button. The information bar should say `BS  Border r-b`.
17. Click the Test Image button.
18. Use the left and right arrow keys to align the right side of the colored background with the right side of the outlined box. Again, you may be allowed only one keypress.

19. Press ESC or click the right mouse button.

20. Select Save As from the Project menu and save the file as **MyMonitorDefs** in the **ENVRC:Retina** directory.

Note that neither of the Frequency buttons were needed to define this screen mode.

That's all there is to it! If you want to, go ahead and create 640 x 200, 320 x 400, and 320 x 200 screens. Use Append from the Project menu to add these to the MyMonitorDefs file. Next, select Append Group from the Project menu. Finally, edit your MyMonitorDefs file with an ASCII text editor, as described below, to add the screen ID numbers to the GIDS line. Remember to add the RetinaMonitor command, detailed above, to your User-Startup file.

Note: For the 200-pixel high screens, select Doublescan from the Edit menu (RIGHTAMIGA+D) before you start setting up the screen. The screen may flash when you turn this on, but that's OK because you will be changing the horizontal frequency with the above steps. Make sure Doublescan is off for the 400-pixel high screens though.

Creating a Group

A screen mode definition file created with DefineMonitor, looks like this:

```
; 800 x 600, 8 Bit, 37848 Hz, 60 Hz
ID  805114835  FQ  38000000  MD  0  FLG 0
SW  800  SH  600  MW  800  MH  600
HBS 201  HSS 202  HSE 218  HBE 247  HT  246
VBS 601  VSS 602  VSE 612  VBE 628  VT  628
```

```
; 800 x 600, 16 Bit, 37848 Hz, 60 Hz
ID  805114846  FQ  76000000  MD  3  FLG 0
SW  800  SH  600  MW  800  MH  600
HBS 401  HSS 402  HSE 433  HBE 498  HT  497
VBS 601  VSS 602  VSE 612  VBE 628  VT  628
```

Note that the screen ID numbers for the above screen modes are 805114835 and 805114846. These are important when defining a group. The lines beginning with a semi-colon (;) are comment lines.

If you had selected Append Group from the Project menu, a line similar to the following should be there:

```
; Group ID
ID  805114969  MD  3  FLG  32
GIDS
```

To create the group just use an ASCII text editor and add the screen ID numbers to the GIDS (Group IDs) line. The entire file might look like:

```
; 800 x 600, 8 Bit, 37848 Hz, 60 Hz
ID  805114835  FQ  38000000  MD  0  FLG 0
SW  800  SH  600  MW  800  MH  600
HBS 201  HSS 202  HSE 218  HBE 247  HT  246
VBS 601  VSS 602  VSE 612  VBE 628  VT  628

; 800 x 600, 16 Bit, 37848 Hz, 60 Hz
ID  805114846  FQ  76000000  MD  3  FLG 0
SW  800  SH  600  MW  800  MH  600
HBS 401  HSS 402  HSE 433  HBE 498  HT  497
VBS 601  VSS 602  VSE 612  VBE 628  VT  628

; Group ID
ID  805114969  MD  3  FLG  32
GIDS 805114835 805114846
```

DefineMonitor Menu Reference

Project Menu

Save (RIGHTAMIGA+S) and **Save As** (RIGHTAMIGA+A) Use to save your screen mode definitions.

You might keep all your screen mode definitions in one file called "MonitorDefinitions" and store it in ENVARC:Retina. This is not required, however.

Append (RIGHTAMIGA+W) If a screen mode definition has already been saved, this option will add the current screen definition to that existing file. If you haven't previously saved a file in the current session, a file requestor will appear for you to designate which file the definition should be appended to.

Append Group This will add a group ID to a file. You will have to manually edit the file with an ASCII text editor to add the desired screen modes IDs to this file.

About Opens informational window.

Quit (RIGHTAMIGA+Q) Exits the program.

Edit Menu

Interlace (RIGHTAMIGA+I) or **Doublescan** (RIGHTAMIGA+Q) These options for the current screen are mutually exclusive. (i.e., They cannot be selected at the same time.)

HSync Positiv (RIGHTAMIGA+H) Toggle the horizontal sync polarity between positive (checked) and negative. Effect depends on the monitor.

VSync Positiv (RIGHTAMIGA+V) Toggle the vertical sync polarity between positive (checked) and negative. Effect depends on the monitor.

Modify Allows you to select the effect of the corresponding buttons from the menu.

Pixel Frequency Will simultaneously change the pixel clock and vertical and horizontal frequencies to the **Next** (RIGHTAMIGA+PLUSSIGN) or **Previous** (RIGHTAMIGA+NEGATIVESIGN) settings.

Settings Menu

Line Ratio This sets the relationship of the displayed portion of the screen to the non-displayed portion of the screen.

Assembler Output Definitions will be saved in assembler format. This option is for use by developers.

Chapter 10
Other Retina Utility Programs

The following is a discussion of the various other utility programs supplied with your Retina software. Some of these programs do not have icons and are meant to be run from the CLI.

RetinaAvail

RetinaAvail is the Retina equivalent of the AmigaDOS Avail command. It will display the recognized memory on the Retina card. For example, starting RetinaAvail from the CLI with a 4MB equipped Retina would yield the following output:

```
Available      In-Use   Maximum
4194240          64     4194304
```

Note: 64 bytes are used internally for the retina.library.

If you should have a large 24-bit screen open, the output might look like:

```
Available      In-Use   Maximum
  2854016     1340288  4194304
```

While the maximum value is hardware dependent, the other values depend on the utilization of the Retina. The more screens that are open and the higher their resolutions are, the lower the available memory will be. The in-use value will display the memory currently used by screens, sprites, and animations.

Syntax: RetinaAvail [List] [Flush]

Use List to display a list of Retina memory locations used. Use Flush to clear out any images being held in Retina memory.

RetinaComm

RetinaComm is an AmigaDOS commodity and offers two different functions. First, it enables a user to go through all existing screens using screen-to-front and screen-to-back functions. The keys can be defined by the user, but the default setting are: LEFTAMIGA+SHIFT+N or LEFTAMIGA+SHIFT+M.

Secondly, RetinaComm offers a screen saver for the monitor connected to the Retina. You can define timeouts between 10 seconds and 30 minutes. If no actions--like mouse events or keystrokes--are detected for the defined period of time, your screen will be blanked. The screen will be reactivated after any mouse event or keystroke.

Please note that mouse movements in XiPaint are not recognized by RetinaComm. So, the RetinaComm may switch the screen to black even though you have moved the mouse. The solution is to press a key not used by XiPaint, like the Alt key.

Running RetinaComm

RetinaComm can be started from the Workbench or CLI. The first time it is started from the Workbench, the window will not be opened. This makes it possible to be started from the WBStartup drawer. Subsequently double-clicking its icon will open its window.

If you start RetinaComm from the CLI, the window will be opened normally. If you want to suppress that, use the parameter CX_POPUP=NO. This enables you to start RetinaComm from the user-startup, if you do not wish to use the Workbench WBStartup drawer.

EXAMPLE **Run >NIL: RetinaComm CX_POPUP=NO**

RetinaFrameCounter

Syntax: RetinaFrameCounter [Window]

This CLI utility displays in real time, frames-per-second information for Retina animations. Use the Window option if the animation is being shown in a Workbench window.

To use, from a CLI prompt enter: **Run RetinaFrameCounter**. Then play a RACE animation or show a sequence of images with RetinaDisplay. To quit, press CTRL+C in the CLI window.

RetinaIrq

Syntax: RetinaIrq [ON|OFF]

This will either turn off or on the Retina interrupt detection and thereby enable or disable the Retina's operation. (see also "Temporarily Disabling RetinaEmu" on page 31)

RetinaMemClk

Execute this utility from the CLI to adjust the programmable clock chip in the Retina BLT Z3. (It has

no effect on the Z2 model.) Just click the Determine Maximum button to automatically calculate the maximum setting for your configuration. Then click Save to store the setting. You also can drag the Frequency slider to set a specific value.

RetinaMonitor

With RetinaMonitor, you can check the list of available monitor definitions. This covers all of the defined screen modes and groups, not just the ones available to a particular monitor. RetinaMonitor is also used to append self-defined screen modes created with DefineMonitor. (see "Using Custom Screen Modes" on page 53)

Syntax: RetinaMonitor [List|Groups|Append <file>]

List This will list all screen modes, including groups.

Groups This will list all screen mode groups.

Append <file> This will append screen mode definitions created with DefineMonitor.

If you are appending 4-bit screen modes, RetinaMonitor must be run before RetinaEmu to utilize them.

Examples **RetinaMonitor List**

The output will inform you about the available screen modes, their frequencies and resolutions.

RetinaMonitor Append Envarc:Retina/MyDefinitons

This would append the screen mode definitions created by DefineMonitor that were saved in a file called MyDefinitions stored in the Envarc:Retina directory.

RetinaMonitor has several other options which are beyond the scope of this manual. If you are curious, type **RetinaMonitor ?** at a CLI prompt.

RetinaPalette

When the Workbench is being emulated on the Retina running on a non-AGA machine, the AmigaDOS ScreenMode program will allow you to set the number of colors all the way up to 256. Since normally a non-AGA machine cannot do this, the AmigaDOS Palette Preferences program will still be subject to non-AGA limits.

RetinaPalette was designed as a replacement for Palette Preferences program in instances where the Workbench is being run using colors that exceed your Amiga's normal limits. Note that this is independent of the Workbench depth setting (see "How Deep is Your Love (For Colors" on page 37). This only has to do with the number-of-colors setting in the AmigaDOS ScreenMode program.

Retina4Test

This CLI program will test each of the up to four possible Retina boards installed.

Chapter 11
AnCoS Junior

One of the most amazing applications for both the Amiga and the Retina are animations. Using powerful programs like LightWave 3D, Real 3D, Imagine, MorphPlus and many more, fantastic animations can be rendered. Now with Retina, these animations can be viewed in up to 24-bit color.

Such animations in raw form normally consist of single images, numbered to make a sequence. Often, editing is still necessary. Delays, loops, ping-pong effects, or the appending of other animations are typical edit tasks.

So far, the only way to have visual control while editing was FRED, the frame editor that is part of Elastic Reality's (formerly ASDG) ADPro and MorphPlus. FRED was regarded as a breakthrough, because it generated postage stamp size duplications of the full images that could be played in real time. But these stamps used limited colors and were very small in size, due to the hardware limits of Amiga graphics.

With the Retina, you can do much more. AnCoS (Animation Control System) is based on the same principle as FRED, but the stamps can have 16.8 million colors at a maximum size of 192x144.

AnCoS also supplies extended edit control such as jog-shuttle, delay, block operations, and more. Basically, it is a small non-linear editing program.

It saves the edit decision list in either custom format or as a FRED list. This list will then be the base for programs like MakeRACE or FRED to generate an animation from the original images following the order from the edit list. FRED lists can even be used by VLab Motion.

AnCoS junior is supplied as a full, unlimited version with your Retina and requires the Retina to operate.

A typical AnCoS session would be like this:

1. Select New from the Project menu.
2. Enter a filename or just accept the default **test.project** filename and click the Open button.
3. Select Insert Frame(s) from the Edit menu or press RIGHTAMIGA+I.
4. If you have a numerically sequenced image files, select the first frame (i.e., image) and click the OK button or just double-click the filename. Then select the last frame in the same manner.
5. **Numerically sequenced filenames must have a period as the start of extension.** (i.e., Pic.0001 will work, but Pic0001 will not--LightWave 3D users need to use a "NAME." format.)
6. If you are loading a single image, just select the same file for the first and last frame.
7. If they are not already open, open the Control, Block, Preview, Stamp, and Delay windows using the Windows menu.

8. From the Stamp menu, set the stamp size and depth. Use 160x120 in 16 Bits for slower systems.

9. Now choose Make All Stamps from the Stamp menu.

After the stamps are calculated, you will see the full-color pictures in the Stamp window. AnCoS does not touch the original images, but creates new images named the same as the originals, but with an .stp extension. They are stored in the same directory as the originals.

You can use the slider in the Control window to browse through the stamps. Of course, you can load in other images whenever you want. With the functions in the Block window, you can rearrange the order of the stamps. If an image should be displayed longer, you can use Delay for breaks in the video flow. This is nice for text tables and other images that need longer display time.

After you are happy with the animation, you can save the result as an AnCoS project or as a FRED list. Use the later option if you plan to use ADPro or RACE for further processing.

If you leave AnCoS, the status and position of the windows will be saved automatically.

We are sure you will like AnCoS--it is revolutionary. A detailed manual is not reproduced here; however, you can find out about the features easily through experimentation.

Chapter 12
RACE: The Animation Tool

RACE is an animation system that uses enhanced delta compression for storing only significant differences between the images of a sequence. If data is the same or similar enough, this part of the image will not be renewed. Using this method, even full-screen, high resolution animations can be displayed in real time.

RACE consists of MakeRACE, a program that compresses sequences and audio files to a single animation file, PlayRACE, the corresponding player, and CopyRACE, a tool to move an animation file to a partition for faster playback.

RACE has many unique features:

- Support for 8, 16, or 24-bit images in any resolution.
- Real time playback from RAM or disk.
- Simultaneous playback of mono/stereo audio and video. Toccata (MAUD), Maestro, and 8SVX audio file formats supported.
- Automatic adjustment of the compression algorithm and intelligent handling of datarate peaks.
- Works will all file formats supported by the multipic.library. Formats can even vary within the same sequence.
- Automatic conversion into 8, 16 or 24-bit, with automatic dithering for 8-bit.

- Compatible with FRED lists, so there is no need for perfectly numbered sequences.
- Optimized Zorro III mode for fast operation with Retina BLT Z3

Please read this section of the manual thoroughly before starting. The process of designing an animation can be quite complicated and this manual can give you many time-saving hints. In any case, you will have to experiment with RACE in order to fit the settings to the source material and your system capabilities.

Animation Technique

In general, an animation is the fast display of single images giving the illusion of motion. Everyone has been exposed to various animations (e.g., TV, movies, video, etc.).

The realism of an animation depends upon the quality of the images and the display rate. A cinema movie is played using 24 images per second, NTSC video is using 60 half-frames (30 full frames) per second. Cartoons often use as little as 12 frames per second.

Conceptually, playing animations from a computer is simple. The images of an animation have to be displayed in quick order. But most computers, including the Amiga, with limited RAM and disk performance as well as limited bus speed, cannot play NTSC quality images at anything near 30 frames per second.

Compression of the Animation Data

In order to play animations in real time, the amount of data needs to be reduced. Probably the most common way to achieve this is by storing the differences between images only. This so-called "delta method" is common and used in formats like ANIM 5.

RACE can do pure delta compression, but in most cases, there would still be too much data. So, RACE has optional "lossy" compression methods. Assuming that parts of two images are only slightly different, but not exactly the same, RACE can ignore the changes in order to keep the data rate low and therefore the frame rate high. The human eye is very tolerant of small uncorrected areas in moving pictures, which allows these low data rates.

The big questions are: How much change can be ignored, and when is storing the differences necessary?

Lossy Compression and Thresholds

In order to keep an animation working in real time, RACE can drop parts of the changes within images and even leave images out. So, the result of the animation is not identical to the source sequence anymore. This is a lossy compression because data is lost.

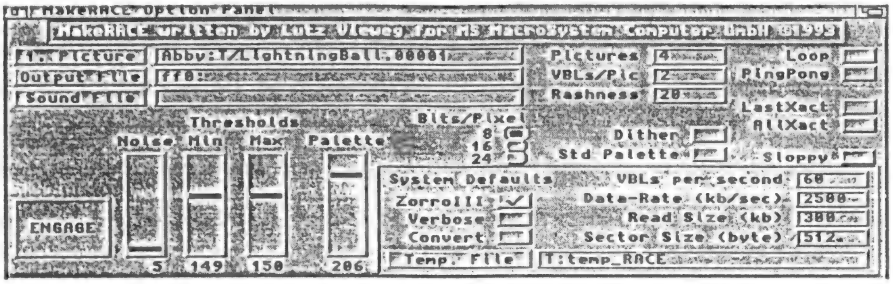
This loss actually pays you back by allowing smooth animations in resolutions and colordepths that no one else has done with an Amiga before.

Three thresholds help RACE to decide how much data can be ignored. The calculations needed for this procedure are very complicated. RACE also needs

information about your system to be able to optimize animation compression.

Making a RACE Animation

MakeRACE is the animation compression program used to create a RACE animation file. It can be started from CLI or from the Workbench. All the parameters can be specified as options from the CLI. When started from the Workbench, it opens its user-interface.



1. Picture Clicking brings up a file requestor used to specify the path:filename of the first image in the sequence. The information can also be typed in manually in the string gadget to the right.

You also have the option of loading a FRED list sequence file, like one created with AnCoS.

Output File Clicking brings up a file requestor used to specify the path:filename to be used for the resulting animation file. The information can also be typed in manually in the string gadget to the right.

If you enter a hard drive partition name without a filename (e.g., HD3:), you will create a non-DOS RACE animation partition. (See also "CopyRACE" on page 82).

Use this option with caution because it will totally destroy any data existing on the partition.

Sound File Clicking brings up a file requestor used to specify the path:filename of the audio file to be used with the animation. The information can also be typed in manually in the string gadget to the right. This is an optional parameter.

Pictures Sets the number of images in the sequence. For example, if you had an image sequence named Pic.001 through Pic.050, you would enter 50.

VBLs/Pic Sets the number of vertical blanks per image to be used. With video, this usually occurs twice every full frame, so this should normally be set to 2, if you are trying to play back images to approximate NTSC video at 30 frames per second.

Rashness Sets the maximum amount of time an animation may exceed its specified timing to 1/x of a second, where x is this setting value. A value of 20 should work in most cases.

Loop If active, the created animation will be looping.

PingPong If active, the created animation will play forward and then backward. Note: This will only occur once unless the Loop feature is active.

LastXact If active, the last image in the sequence will be stored in total, not just the deltas (changes). Use this when the last image will stay on screen. Your eyes are more easily fooled with moving images; A static image may show some of the compression flaws.

AllXact If active, all images in the sequence will be stored in total ("lossless" mode). This is the pure delta (change) compression mode and normally shouldn't be used, except for maybe rendered images (i.e., not digitized video).

Sloppy If active, every frame will be shown, even if the animation is not able to keep up with the specified playback rate. Note: This option cannot be used when there is audio.

Bits/Pixel Sets the desired display depth, 8, 16, or 24-bit. Note: 16-bit is an excellent choice and may be nearly indistinguishable from 24-bit. Also, if you select 8-bit and the source files are not already in an 8-bit format, MakeRACE will convert them first and save them with a .256 extension. (This uses additional drive space.)

Dither (8-bit animations only.) Applies Floyd-Steinberg dithering to images and creates new files with an .256 extension.

Std Palette (8-bit animations only.) If active, MakeRACE will calculate an average palette to be used for all frames. This may not be the visually optimal palette, but it is a good compromise. Using this option should speed up the playback rate.

Engage Click to begin creation of the animation based on all existing settings.

Noise Threshold Sets the program's toleration for noise level. Rendered images, like ones from a 3D rendering program, have no noise, but any digitized video material will. In fact, with digitized video, no pixel is the same as in the last image, not even in a static scene. RACE will

ignore any change which is under the set noise level. Note that this setting is considered, even if AllXact is active.

Minimum Threshold If the change from one frame to the next is less than this value, RACE will only store the differences if it can do so and still stay well below the specified Data-Rate. This leaves headroom for buffering, which allows more complicated animations to be played and smoothes out peaks. This setting is far less important than the maximum threshold. A safe setting is one below the maximum threshold.

Maximum Threshold Sets the maximum change from one frame to another that can be ignored. If the change is greater than this threshold, RACE will not leave it out. If the change is weaker, it will only drop the change if it will make the animation exceed the specified Data-Rate. The higher this value is, the higher the compression ratio is, and thus the lower the quality of the animation. 0 means: Store all pixels, 255 means: Leave out any pixel, if necessary.

Note that when extreme changes are left in, RACE may have to skip frames if it cannot keep up with the defined frame rate. (see also the "Sloppy" option).

Palette (8-bit animations only.) Sets the level for changes from the last frame that should trigger using a new palette. A lower setting will yield more palette changes, while a higher setting will yield less. A setting of 255 will use the first frame's palette for all frames. Note: Fewer palette changes will allow faster playback.

ZorroIII If active, the special encoding for Retina BLT Z3 boards is used.

Verbose If active, detailed information will be displayed while the animation is being created.

Convert Reformats images using slower loading formats (e.g., JPEG) into SUNRASTER format. This saves time in the long run when you compile the same images several times, which may be necessary when tweaking an animation to run optimally. **Note: this will actually change the source files.**

Temp. File Clicking brings up a file requestor used to specify the path:filename of the file to be used for temporary storage by MakeRACE. The information can also be typed in manually in the string gadget to the right.

VBLs per second Set to the desired vertical refresh frequency of the screen mode you have picked in RetinaScreenMode. Typically this is 60 Hz for NTSC monitors or 50 Hz for PAL. Refer to RetinaScreenMode to get the value you need to enter.

Data-Rate Set the number of kilobytes of data per second your system can handle. There is no easy way to determine this value, it depends your CPU, Amiga model, Retina type, hard drive and hard drive controller, etc. 1500 (i.e., 1.5 MB/sec) is a good starting point for animations to be played from disk. Animations played from RAM might have a setting as high as 2500 with a Z2 board or 7500 with a Z3 board. You need to experiment. If an animation is jerky, you need to lower the rate. After you have found the optimum, you should

only need to modify this value when there is a change in system hardware, like after adding an accelerator.

Read Size Sets the maximum size of data to be read at one time in bytes.

Sector Size Sets the sector size of your storage device in bytes. Generally the default 512 should be used.

To quit MakeRACE

Click the close window gadget to quit MakeRACE.

Example This example assumes you have 50 numerically sequenced YUVN format image files named Pic.0001 to Pic.0050 grabbed with VLab, an audio file named Song.maud digitized with the Toccata board..

1. Start MakeRACE from the Workbench.
2. Click on the 1. Picture button.
3. Choose the first image, **Picture.0001**.
4. Enter 50 in the Pictures string gadget.
5. Now, click the Sound File button and choose the sound file, **Song.maud**.
6. Click the Output File button and specify **Test.race** as the output filename to be stored in RAM:.
7. Select 16 under "Bits/Pixel". This will look far superior to 8-bits and compile quicker (no dithering computation), plus it will look very close to 24-bit.

8. Set VBLs per second to the refresh rate that you have set in RetinaScreenMode for a 16-bit display, e.g. 60 (Hz).

9. Set the Data-Rate to 1500, for now.

10. Leave the read size and sector size at their default values.

11. If you have a Z3 Retina, activate the Zorro III option.

12. Turning Verbose on will give you more details when compiling your animation. It will not affect the animation.

13. Convert should be activated if your hard drive has enough free space. It will convert the YUVN images into SUNRASTER format during the first compression run. The images will load much faster from then on. This can be a real time-saver if you are experimenting with various MakeRACE settings and perform multiple test runs.

14. Set the VBLs/Pic to 2. This means, a new picture is displayed at every second screen refresh. If the screen is running at 60 Hz, 30 frames per second would be displayed. If you entered 3, the anim would be calculated at 20 frames per second, and a 5 would mean 12 frames per second.

15. Leave Rashness at the default setting of 20.

16. Activate the Loop option to loop the animation.

17. Leave the PingPong option off.

18. Leave both the LastXact and AllXact options off.

19. The Sloppy option should be ghosted. This is because Audio has been loaded.

20. Depending on the quality of the video, set the Noise threshold level from 30 to 70. The Maximum threshold should be 100 and the Minimum 50 for now. You will have to experiment with these settings.

21. Click the Engage button to compile the animation.

MakeRACE's CLI Options:

MakeRACE <picture base name> <number of frames> <animname> [TEMP <filename>] [FPS <frames per second>] [RATE <kb per sec>] [LOOP <ON|OFF>] [ALLXACT ON|OFF>] [VBLS <number>] [MAXTHRES <value>] [SLOPPY ON|OFF>] [MINTHRES <value>] [SOUND <soundfile>] [PINGPONG ON|OFF>] [24BIT|16BIT|8BIT] [LASTXACT <ON|OFF>] [RASHNESS <value>] [VERBOSE <ON|OFF>] [NOISETHRES <value>] [READSIZE <kb per read>] [SECSIZE <byte>] [CONVERT <ON|OFF>] [DITHER <YES|NO>] [PALTHRES <value>] [STDPALETTE <YES|NO>] [GUI] [ZORRO3]

All of these options work just like their GUI counterparts.

Note: if you type MakeRACE with no options, the user interface will appear. However, you will first have to execute the AmigaDOS command **Stack 20000** before it will run properly. You can also type **MakeRACE ?** to display the list of its options.

Special Consideration for 8-bit Animations

It should be obvious that an 8-bit version of an animation will play faster than 16-bit version. However, there are only 256 possible colors for each frame which can dramatically impact quality. 8-bit is not a so-called "true-color" mode but palette-oriented. 16 and 24-bit are a true-color modes because a pixel can be any color from a 24-bit palette.

The Palette threshold and Std. Palette option affect when and if the palette changes from one frame to the next. The less palette changes there are, the faster the animation can be played. The Dither option can also impact playback. Although it can make pictures look better using only 256 colors, it can increase the change from one frame to the next (i.e., increase the delta). This can make playback slower.

PlayRACE

Use PlayRACE to play RACE animations.

Generally you need to start PlayRACE from the CLI. However, it can be started from the Workbench, but you will not be able to set any options nor play partition animations.

PlayRACE's CLI Options:

PlayRACE <RACE Animation file> [LOOP] [MINMEM < kb >] [MINCMEM < kb >] [IOPRI <priority>] [REFPRI <priority>] [AUDPRI <priority>] [DELAY <VBLs>] [BOARDNUM <number>] [SPEED] [NOTONWB]

Animation file This is normally a RACE animation file created with MakeRACE. It can also be a special partition created with either CopyRACE or MakeRACE.

EXAMPLE **PlayRACE HD2:**

LOOP Play an animation in looped form. CTRL+C will stop it.

SPEED This is a debugging option which will tell you if the Data-Rate used to make the animation was correct. If it displays 0 %, your system can probably handle a higher Data-Rate setting. If a positive value is displayed, your system is slower than what you specified.

MINMEM Sets the number in kilobytes of Fast RAM that PlayRACE should keep free. Note: If there is insufficient RAM, the animation will play off the hard drive.

MINCMEM Sets the number in kilobytes of Chip RAM that PlayRACE should keep free. Note: If there is insufficient RAM, the animation will play off the hard drive.

IOPRI Sets the hard drive read priority. Change this if RACE does not properly read off your hard drive.

REFPRI Sets the display refresh priority. Change this if RACE does not properly read off your hard drive.

AUDPRI Sets the audio priority. Change this if RACE does not properly read off your hard drive.

DELAY Additional vertical blanks between frames. This will slow the playback of an animation.

BOARDNUM When multiple Retinas (four maximum) are in use, this identifies the board to use. They are numbered 0 through 3 (0 is the default).

NOTONWB If you are running the Workbench using the same color mode as the animation (e.g., 16-bit or 24-bit), the animation will play in a resizeable window on the Workbench. If this switch is active, the animation will play on its own screen. (Note: Playback in a window is much slower than on a separate screen.)

CopyRACE

Race can play animations faster from a dedicated hard drive partition because the normal Amiga filesystem is bypassed. For doing such a playback, you need to copy a RACE animation file to that partition using CopyRACE. Do not specify a filename when prompted for the destination, only enter the partition name. Otherwise, CopyRACE will do a normal copy.

The special partition can also be created directly from MakeRACE by entering the partition name alone for the Output File.

WARNING: This will totally destroy any data existing on that partition, so use with caution.

Chapter 13
Digital Image

Digital Image is a 24-bit image processing program. The program is provided "as is" and the documentation is currently only in German. (An English translation is hopefully forthcoming.) In the meantime, here is some information to help you get started. (Note: If you are familiar with other image processing programs, you should be able to figure out nearly all of Digital Image's functions.)

Setting the Screenmode

Digital Image operates in the Retina Deep mode so it can display 16 and 24-bit images in a window. Therefore, although you set the basic screen size in RetinaEmu, it will look to the 16-bit (65536 colors) or 24-bit (16.8 Mio) setting in RetinaScreenMode for the actual screenmode. Note: Having those set to groups provides the most flexibility. (see also "The RetinaScreenMode Program" on page 17)

You may have to play around with the RetinaEmu screenmode selection before you find one that looks good.

Once you have Digital Image running, click the prefs button listed under setup. Select a 16 or 24-bit Retina display. Next click on the screenmode button and enter the width and height of the screen defined in RetinaEmu. Now click the do-it button. You might also want to select

your save format on this window. Click the close gadget to close the window.

The Image Buffers

Digital Image can hold multiple images. However, only the image in the "actual" buffer can be worked on. That image is listed in the actual-buffer box in the main window. If you have more than one image loaded, you can change the image in the actual buffer by clicking on its window.

Since Digital Image lacks a formal undo, you should work on a copy of your image by opening the buffer window, clicking on the image name and then clicking the copy buffer button. The new copy will be automatically loaded into the actual buffer.

Other Operations

When more than one image is loaded, make sure you click on the appropriate image window before selecting the 'do-it' button to perform an operation.

Digital Image has direct hooks into XiPaint and VLab.

To Quit

To quit Digital Image, simply click the close window button on the main window. All preferences are automatically saved.

Chapter 14
XiPaint and Demo Programs

XiPaint

XiPaint is a powerful 24-bit graphics program. We have licensed this software package to give you the opportunity to paint using 16.8 million colors on the Retina card.

Click on the XiPrefsE icon to select the screen mode you want to use. Click on "Retina, ohne Emul." and then click the Select Display button. You can choose between 16 and 24-bit screen modes. Once you have selected a screen mode with your mouse, click the Save button.

Now click the XiPaint icon to run the program.

To terminate the XiPaint session, select Quit from the Project menu.

Please refer to the XiPaint manual for further information.

Problems and Suggestions

Since XiPaint was not programmed by MacroSystem, you may report wishes or problems to us, but we can only pass this on to the authors of XiPaint.

Demonstration Programs

Various programs that demonstrate features of the Retina are included.

PanelDemo

This CLI program will demonstrate the paneled (i.e., overlapping) screen capabilities of the Retina. Press CTRL+C to exit.

Note that both screens are the same screen mode at different resolutions. Often, applications that use paneled screens use different screen modes for each screen and thus their screens cannot be paneled.

RetinaDemo

RetinaDemo will demonstrate some graphic operations of the Retina.library. You will get some help by typing: **RetinaDemo ?** at a CLI prompt. Press CTRL+C to exit.

ScrollDemo

This CLI program will show the scrolling screen capabilities of Retina. Press CTRL+C to exit.

Chapter 15
The Multipic.library

The multipic.library is used by all MacroSystem programs, like AnCoS and RetinaDisplay. It contains, in a condensed form, all of the necessary routines needed to load and save images in multiple file formats. Interested programmers can get (generally free) licenses directly from MacroSystem.

Currently, the following file formats are supported:

File Format	Type
BMP	1 to 8, 24-bit (uncompressed only)
IFF DEEP	24-bit RGB, RGBA [TVPaint, VLab]
IFF ILBM	1 to 8-bit (2-256 colors incl. EHB)
	HAM (4096 colors)
	HAM8 (262,144 colors)
	12-bit
	24-bit (incl. CLUT)
IFF RGB8	24-bit [TurboSilver, Imagine]
IFF RGBN	12-bit [TurboSilver, Imagine]
IFF YUVN	YUV-411, YUV-211 and grayscales [VLab]
JPEG	8 or 24-bit highly compressed

PGM	8-bit grayscales
PPM	24-bit
QRT	24-bit [DKB-Raytracer, QRT-Raytracer]
SUNRASTER	1 to 8, 24-bit (uncompressed only)
VLab	Internal VLab YUV format
XiPAINT	24-bit [XiPaint, TruePaint]

The following formats will load the fastest:

SunRaster, YUVN, VDP, and IFF-DEEP

Chapter 16
Special Application Enhancements

Special utility programs and libraries have been provided to enhance the operation of some third-party applications. Retina also adds special features to other products from MacroSystem.

ADPro Utilities

ADPro (Art Department Professional) by Elastic Reality (formerly ASDG, Inc.), is a powerful image processing program and a standard on the Amiga platform. The provided Retina ADPro saver will allow you to display 24-bit color, 8-bit grayscale, and rendered images on your Retina. You can even display AGA-only formats like HAM8 and 256-colors. (Also included is a VLab loader that allows you to directly control VLab from ADPro.)

There are buttons in the saver interface to select the display mode. If an image is larger than the display size, use the cursor keys to scroll around the entire image. The saver uses the screen modes set in RetinaScreenMode. HAM8 and HAM are displayed on a 24-bit screen.

The saver is totally ARexx compatible. See the sample ARexx script called _LoadNShowRETINA stored in the ADPro Loaders2 directory.

ADPro version 2.5 and greater

Beginning with ADPro version 2.5, the Saver is not totally necessary. Images can be directly displayed on the Retina card from ADPro by clicking Execute or Redisplay buttons. You can also display an image in a window, which works especially well when running ADPro on a 256-color screen. The Retina screen modes will appear in the list of available render screens.

If ADPro is not automatically listing the Retina screen modes as a possible render screen, the problem may be a naming mismatch. The Retina file in the ADPro Displays2 directory must be spelled the exact same way as a reference within the file. If the filename is Retina (uppercase letter R). Simply use the AmigaDOS Rename command and rename the file to "retina". If you still cannot get it to work, contact Elastic Reality.

Real 3D Support

Real 3D is a 3D modeling and rendering program from RealSoft.

Installation Instructions

1. Copy the file **retina_r3d.library**, located in the R3D drawer, to your **LIBS:** directory.
2. Copy the file **Retina3D**, also located in the R3D drawer, to the **R3D2:Accessories** directory.

How to use Retina3D

Select the menu item External Screen/Settings and enter **retina_r3d.library** into the string gadget (Note: This is

case-sensitive!). Select your preferred format for saving files (e.g., IFF 24. Custom format is not supported.) Click on OK and save your environment.

Now select External Screen/Open from the menu. If the driver has not been used previously, a requester will open and ask you about the type, the window size, and the screen mode. You have three choices:

1. **RetinaScreen** This is a simple RetinaScreen that you can select using the ScreenMode button. This mode does not know windows, however.

2. **DeepScreen** This is an emulated Intuition screen that you can specify again using the ScreenMode button. In this mode, a window will be opened on this screen. Using the Window Size button, you can set the size of the new window. You have a choice between: FullScreen, the window will be the full size of the screen; HalfScreen, the window has half the height and width; Free, the window will be opened in the given dimensions inside the Width and Height button. The size can be changed later. The mode is only valid when RetinaEmu is running.

3. **DeepWB** As above, but the window will be opened on the Workbench. This mode is only valid if the Workbench is running in 16 or 24-bit deep mode.

To display your scene on the Retina, activate your View window and open the Settings window (RIGHTAMIGA+S). Select External as output. Rendering the scene (RIGHTAMIGA+R) will now render your output directly to the Retina.

To change the window size, you can:

1. Activate External Screen/Set Modes in the View window and proceed as explained above.

2. In the Retina3D window, activate FullScreen, HalfScreen, or QuarterScreen. Please note that you will have to reselect External in the View window. There is currently no other way to inform Real3D that the size has been changed. Hopefully, RealSoft will change this in a future version.

3. Simply reduce the window by using the sizing gadgets. Then, you will have to use the menu item Change RenderSize. You will have to inform Real3D about the change using the above described method.

ImageMaster Support

A Retina driver for "ImageMaster" by Black Belt Systems, Inc. is provided. ImageMaster is another image processing program for the Amiga.

If you had the installation script install the ImageMaster files, they should now exist in the proper directories. The RetinaView program should be in the ImageMaster cmpi directory and the RetinaView.rexx script should be in the rxpi directory. Make sure this is so before proceeding.

Follow these instructions to install the driver:

1. Set the screen mode for the 24-bit screen with RetinaScreenMode.

2. Start Imagemaster and enter the Display menu.

3. Look for the Redraw Script string gadget and enter the text **RXPI:RetinaView.rexx**.

4. Click the Call Redraw Script button to the left of the string gadget.

5. Save the settings.

Any time the screen is displayed, the primary buffer will be displayed on the Retina. If the picture is larger than the Retina screen, the clip will be displayed centered over the area which has been changed last.

Please also refer to the ImageMaster manual.

Harlequin Graphics Card

The Retina can also run applications written for the Harlequin graphics card by the Amiga Centre Scotland. This is a $2,500 card done for studio applications. The Harlequin was one of the first available 24-bit cards for the Amiga and many third party applications support it.

The install script will automatically copy the harlequin.library to your LIBS: directory. This is a library emulating the Harlequin at full speed. It cannot be used by the Harlequin itself.

VLab

Retina significantly enhances the operation of VLab by allowing running video or grabbed images to be displayed using more colors.

Incidentally, XiPaint, the included 24-bit painting program, can control VLab and display running video in a window, eliminating the need for a second monitor. An image can be grabbed directly into XiPaint for immediate editing.

VLab Motion

VLab Motion's MovieShop program can be run in deep mode allowing stamps to be displayed in 16 or 24-bit. Also, the higher resolution screens possible with Retina will allow more interface windows to remain open.

Chapter 17
Optional Accessories

Automatic Video Switchbox

This product provides a true one-monitor solution for Retina owners. Without the need to manipulate any mechanical device, the Automatic Video Switchbox will make sure the correct video is displayed on your monitor, whether it is from the Retina or normal Amiga output. The integration is so seamless that it is hard to believe that two independent video sources are being used.

Composite and Y/C video output capability can be added to the switchbox, by installing the optional V-Code module. The output connectors are right on the switchbox.

The switchbox is available from NoahJi's for $139.

V-Code Module

The small module can be installed right on a Retina BLT Z3, which already has the composite and Y/C video connectors on its mounting bracket. For Retina Z2 owners, the module can either be purchased as an external unit for $139, or it can be installed into the Automatic Video Switchbox. The module by itself costs $69. The device can encode any video compatible signal (i.e., 15kHz 50Hz(PAL) or 60Hz(NTSC)), including Amiga video.

1084 Cable

This monitor cable will allow a standard 1084 series monitor to be used with the Retina. However, the capabilities of these monitors are severely limited. As such, only 15KHz and non-high-resolution screen modes will be available. You'll get a lot more out of your Retina using even a low-end VGA monitor. You may still need to fall back on your 1084 for those ill-behaved applications. The 1084 cable is available for $29 from NoahJi's.

Prices subject to change without prior notice.

Chapter 18
Glossary of Key Terms

AGA Stands for "Advanced Graphics Architecture." (Sometimes also referred to as the AA (double-A) mode.) The AGA chip set allows up to 8-bit display modes regardless of resolution. Used in the Amiga 1200 and 4000 series computers.

AppIcon This is a special Workbench icon where you can drop other icons on it and have it processed. Generally, when you double-click an AppIcon, the relevant program's interface will appear.

Bitplanes This refers to the concept that each pixel in a screen is a certain number of bitplanes "deep." This directly impacts the possible number of colors for each pixel.

For example, a 24-bit screen is 24 bitplanes deep, allowing 16.8 million colors (2^24) and an 8-bit screen is eight bitplanes deep, capable of 256 colors (2^8). (Note: The Amiga HAM modes are a special case.)

Color Depth See "Bitplanes."

Commodity Commodities are background programs that control certain events and include programs like (AmigaDOS) AutoPoint and Blanker. For additional information on commodities, please refer to your AmigaDOS manual.

Composite Generally, this is analog video where the chrominance (color) and luminance (brightness) information are combined. See also "Y/C."

Datarate This is the amount of data that is being transferred.

Deep Mode This refers to the Retina's unique ability to let specially-programmed applications show 16 or 24-bit images in Intuition windows. This is a hybrid of an emulated Amiga screen.

Double Buffering This means, while a picture is displayed, another is loaded in the background. The display can switch to the new picture as soon as it is fully loaded, which smoothes out the display of an animated sequence.

Emulated Screen This is where the Retina software creates a screen that "looks and feels" like an Amiga screen to the application that opened it. However, it is displayed on the Retina.

HAM Modes The Amiga HAM modes (HAM8 and HAM) use a method of defining pixels based on other pixels. This allows more total colors than normally possible, but limits the accuracy of each pixel (a problem sometimes known as "fringing").

Horizontal Frequency This is the number of times a screen is redrawn horizontally every second.

Hz Abbreviated for hertz. Cycles per second.

Interlace Flicker On an interlaced display, the odd and even horizontal lines are "drawn" at different times (just like on a TV). If this is not done fast enough, it is

perceived by your eyes as flicker. Using a vertical frequency of 70Hz or above will minimize flicker.

Intuition This is the part of the Amiga operating system used for the graphical user interface (e.g., windows, gadgets, etc.)

KHz Abbreviated for kilohertz. One thousand cycles per second.

Multiscan This is a type of monitor that handles a wide range of horizontal and vertical frequencies. The Commodore 1950 and 1960 monitors, for example, are multiscan monitors and somewhat unusual because they can handle the standard Amiga 15.75Hz video modes. Most multiscan monitors used with PCs and Macs cannot go this low. Standard VGA monitors have nearly fixed horizontal and vertical frequency capabilities.

Panels This term is used to describe where multiple screens are displayed simultaneously. This happens when you pull down a normal Amiga screen to show another underneath, or where an application's control panel is on a separate screen pulled slightly up from the bottom.

Preferences Programs These are the AmigaDOS/Workbench preference setting programs stored in the Prefs drawer of your system partition. (e.g., ScreenMode, Font, IControl, Palette, Time, etc.)

Refresh Rate See "Vertical Frequency."

Resolution This refers to the height and width of a screen in pixels. (e.g., 640 x 400, 1024 x 768, etc.)

Startup-Sequence This file is the main file executed when an Amiga is booted. It contains various system

setting commands and routines. Generally, it is not recommended you edit this file.

Screen Mode A screen mode is defined by its resolution, horizontal and vertical frequencies, and the number of bitplanes it uses.

Screen Mode Group This is a group of individual screen modes. Using a group allows the Retina software to automatically pick a screen mode for you.

ToolTypes These are the entries contained in a program's Workbench icon. To see them, select the icon with a single-click and choose Information from the Workbench menu (or press RIGHTAMIGA+I).

True Retina Screen This can only be opened by an application that is specifically written for the Retina. Since there are no Amiga-screen-emulation calculations, display performance should be faster. An added benefit is that 16 and 24-bit displays can be used.

User-Startup This is a file in the S: directory that should be used instead of editing the Startup-Sequence file, although functionally the two are equivalent. This allows a cleaner upgrade path for future OS versions.

Vertical Frequency This is the number of times a screen is redrawn vertically every second. Sometimes this is referred to as the "refresh rate."

Virtual Screen This is where the screen resolution is greater than the resolution of the screen mode. The Retina allows you to scroll around such a screen using the mouse pointer. One advantage is that this feature allows you to view a very high resolution image that

would normally be outside your monitors capabilities. For example, a 2400 x 1200 image can be viewed on a 768 x482 screen. (see "Virtual Retina Screens" on page 25)

WBStartup This drawer is in your Workbench systems partition (usually Workbench:). Programs dragged to this drawer are executed when the computer is booted. It provides a graphical way to set these programs up. Previously, this would have required editing one of the startup files with a text editor. Note: Programs in the WBStartup drawer are executed after ones in the User-Startup file.

Y/C (Also known as S-Video) Generally, this is analog video where the chrominance (color) and luminance (brightness) information is kept separate providing a higher-quality signal. See "Composite."

Zorro II/III The Amiga expansion slots. These slots are the set of connectors closest to the front of the Amiga. The Amiga also has IBM PC slots and a video slot. On some Amiga models, the different connectors are in-line with one another.

Chapter 19
Troubleshooting

The following are some common problems you may encounter and their solutions

"Couldn't open display!" error message

For some reason, RetinaEmu is unable to display the screen mode the program is trying to use. Try picking a different one. You might also try clicking off the default width and height checkmarks, and setting the auto scroll area to maximum (Screen Settings menu).

The entire screen or parts of it are invisible or not updating properly.

Press CTRL+F7 to refresh manually. If this helps, refer to "Setting the Refresh Mode" on page 27.

Some screens are not centered and some looked squished or too tall

Unfortunately, unless you are blessed with one of the high-end (read: expensive) monitors, your monitor will not be able to show all displays perfectly centered and perfectly sized. You may have to resort to playing with your monitor's video sizing controls.

You can also try to play around with different screen modes and find the best ones for your monitor. At best, you'll probably have to find some compromise in monitor size settings.

This can often happen when a group screen mode is used in RetinaEmu. Try selecting an individual screen mode, instead. Remember, most Amiga applications will only open a 640 x 400 or 640 x 200 screen.

Also make sure you aren't using a virtual Retina screen where the display is smaller than the display. You can tell because the display will seem cut off and the screen will scroll as the mouse hits the display edge.

Use the 256-color Default Screen with the Test Image button on the RetinaScreenMode interface to try individual screen modes on your monitor.

My screen appears to flicker.

If the screen mode is interlaced, try using one that has a vertical frequency of 70Hz or greater. Also using, for example, a 50Hz screen mode, even non-interlaced, can appear to flicker if you are in a country where the standard for electricity is 60Hz. Try using a different screen mode.

After displaying on the Retina, you cannot get back to an Amiga-screen.

Try a either CTRL+F9 or LEFTAMIGA+M.

You cannot get back to a true Retina screen.

Try pressing CTRL+F10.

My application uses overlapping Amiga screens

There are a few programs that utilize the Amiga's ability to display overlapping screens of different resolutions to build their interface. For example, an image processing

program's interface may consist of a large area that can hold images that vary in resolution. Now if the application's control panel popped up on the same screen, it would change size and shape, depending on the resolution of the screen.

Amiga programmers sometimes solve this problem by making, say, a hi-res screen partially visible at the bottom and placing the control panel there. Since this screen overlaps the underlying screen that hold the image, the control panel on it will always look the same.

Unfortunately, the Retina cannot display overlapping screens that use different screen modes. Each screen will appear separately and you'll have to use the LEFTAMIGA+M/LEFTAMIGA+N keystrokes to cycle through the screens. Some programs can overlap three and four screens and you may find it preferable to run these on standard Amiga screens.

The mousepointer jumps, if the right mouse button is clicked

Run the "IControl" program located in your Workbench Prefs drawer. Deactivate the checkmark "Screen Menu Snap" and save. When running on high resolution Retina screens, the Amiga OS thinks you are working with a scrolling screen. In this situation, it thinks that it has to move the pointer to make the menu bar visible.

The mouse pointer will not move to the outer borders of a screen

Make sure you click on the screen to make it active.

CPUBlit is not working

Start it before you run RetinaEmu. CPUBlit will actually speed up emulation significantly on accelerated Amiga.

The CygnusED editor causes problems

Set under "Rendering Choices" the switch for "Máke Screen Public".

I just can't get an application to cooperate with my Retina card.

Ill-behaved programs may sometimes not work properly with the Retina. In such cases, it may be necessary to utilize a switchbox to switch between the Retina and standard Amiga video signals.

I can't get the Retina programs to run from the CLI.

Look for the AmigaDOS Path command that the Retina installation script should have added to your User-Startup file. You should see at least the following directories `HD0:Retina/RetinaSystem` and `HD0:Retina/RetinaTools`, followed by the word "add". (Note: Your directory names may be different.) This enables the system to search these directories for commands entered at a CLI prompt. If not for this, you would have to enter the entire path when executing Retina commands.

My monitor makes an annoying high-pitched noise when I boot up.

This is normal for some monitors. It occurs because there is no signal being sent to the monitor prior to RetinaEmu

being executed. The solution is to run **RetinaDisplay <image> Nowindow Keepscreen** (<image> is some displayable image file) early in your Startup-Sequence file. This will provide a signal to the monitor before RetinaEmu is run.

What's the best way to use the Retina with Emplant?

It is suggested that you do not run Emplant using an emulated Amiga screen on the Retina. Emplant can talk directly to the Retina using its video drivers. If you want a specific kind of screen on the Mac use the Macs Monitors control Panel to make the necessary adjustments. In order to have some flexibility in the types of screen modes that the Mac Emulation can display, choose an "interpretive" video driver like "Retina QDvideo." Choosing this as opposed to a video driver with a specific resolution like 1024x768 (called a "direct driver") will allow you to use the Mac's controls to shift between various color depths and resolutions.

Recoverable Alerts

The following is a list of some of the Recoverable Alert errors that you may encounter when using Retina. These are informational and your system will continue after a mouse button is pressed.

35000100 No Retina hardware was detected.

35010110 No memory on the Retina.

35000111 A program has tried to release memory which was not acquired before.

35000112 A program has tried to release a memory area which was not acquired before.

35010113 Not enough Amiga memory for the management of the Retina memory.

35000114 The acquired memory was not released in full when the library expunge happened.

35000121 It has been tried to close an internal monitor definition with Retina.CloseMonitor()

35000122 Not all opened monitor definitions defined by Retina_OpenMonitor() have been closed before the library expunge happened.

Other retina.library alerts can be recognized by their number format, 35xx 01xx or B5xx 01xx.

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